

Serial Number 09/372,107
Filing Date 11 August 1999
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19990915 049

QUICK ZEROING KNOB

ORIGIN OF THE INVENTION

5 The invention described herein was made in the performance of official duties by employees of the Department of the Navy and may be manufactured, used, licensed by or for the Government for any governmental purpose without the payment of any royalty thereon.

10 1.0 Field of the Invention

 The present invention relates to firearm technology and, more particularly, to a control knob assembly for rapid zeroing of a transverse and elevating mechanism for an automatic gun having a drive train.

15 BACKGROUND OF THE INVENTION

 Automatic guns have transverse and elevating adjusting mechanisms so that the full fire power thereof may be accurately
20 brought to bear on the desired target. The adjustment of the transversing elevating parameters of the automatic gun needs to be accomplished in a quick and accurate manner in order that the automatic gun can perform its designated task.

5 Automatic guns require zeroing of control knobs. As used
herein, zeroing involves the process of turning the control knob
some number of degrees (based on a scale that is referenced to the
knob) to adjust the position of the gun and, then without changing
the position of the gun, move the scale to zero (or some reference
10 point). Prior art zeroing systems typically use an incremented
ring that is separate from the knob. In these systems, the ring is
either moved into place against some friction after the knob is in
position, or the ring is unlocked, moved, and then locked back
down. It is desired that a zeroing system for a control knob be
15 provided that is easier and faster to use than the prior art
systems.

SUMMARY OF THE INVENTION

20 Accordingly, it is a primary object of the present invention
to provide a control knob assembly that is easily operated for
zeroing an automatic gun.

25 It is another object of the present invention to provide a
control knob assembly that provides for zeroing the automatic gun
in one motion by pulling out a knob, rotating the knob to zero and
then letting the knob snap back in place without moving the gun.

30 In accordance with these and other objects, the invention
provides a control knob assembly that may be generally used for

5 rapid zero adjustment of a dial thereof and is particularly suited for rapid zeroing of a traverse and elevating mechanism for an automatic gun.

10 In one embodiment, the control knob assembly provides for rapid zeroing without altering actual position of the mechanism in which it is employed. The mechanism has a shaft with first and second ends and with retaining means at the first end and with a keyway located between the first and second ends thereof. The second end of the shaft has coupling means for coupling to an
15 automatic gun. The control knob assembly comprises a ring, a bushing, a knob, a spring, and a pin. The ring has a key placed around the shaft so that the key is inserted and maintained in a keyway of the shaft. The ring has a first dimensioned opening. The bushing has first and second ends with the second end having a
20 lip thereat and with the bushing being dimensioned and placed around the shaft so that the lip abuts against the retaining means and so that the second end of the bushing abuts against the ring. The knob has an interior with first, second and third cutouts each having predetermined dimensions and an exterior with first and
25 second diameters. The second and third cutouts have a stepped arrangement. The knob has a second opening dimensioned to be complementary to the first opening. The exterior is defined by the first diameter having a dial thereon and having graduations around its border with one such graduation indicating the zero position of
30 the traverse and elevating mechanism. The first cutout is

5 dimensioned so as to accept the insertion of the ring so that its
first opening is in alignment with the second opening in the knob.
The second cutout is dimensioned so as to have a diameter at least
large enough to accept the insertion of the first end of the
bushing. The third cutout is dimensioned to have a diameter that
10 is greater than the diameter of the second cutout and so as to
accept said lip of the bushing. The spring has first and second
ends and is dimensioned so as to be insertable into both of the
first and second cutouts and so that the first end thereof abuts
against the lip of the bushing. The pin is dimensioned to be
15 inserted into and maintained within both of the first and second
openings.

BRIEF DESCRIPTION OF THE DRAWINGS

20 A better understanding of the present invention may be
realized when considered in view of the following detailed
description, taken in conjunction with the accompanying drawings.

25 Fig. 1 illustrates the traverse and elevating mechanism having
a rapid zero elevation adjustment in accordance with the practice
of the present invention.

Fig. 2 is a view of the transverse and elevating mechanism
30 taken along the line 2-2 of Fig. 1.

5 Fig. 3 is a view of the transverse and elevating mechanism taken along the line 3-3 of Fig. 2.

 Fig. 4 illustrates the pointer of the elevating portion taken along the line 4-4 of Fig. 2.

10 Fig. 5 illustrates the rapid zero elevation adjustment mechanism of the present invention taken along the line 5-5 of Fig. 2.

15 Fig. 6 is an exploded perspective view of rapid zero elevation adjustment mechanism of Fig. 5.

 Fig. 7 illustrates a tripod-mounted gun utilizing the rapid zero elevation adjustment mechanism of the present invention.

20 Fig. 8 illustrates further details of the rapid zero elevation adjustment mechanism of the present invention coupled to an automatic gun.

25 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

 Referring to the drawings, wherein the same reference number indicates the same elements throughout, Fig. 1 illustrates the transverse and elevating mechanism 10 of the present invention

5 having a control knob assembly 12 that is of particularly importance to the present invention.

Control assembly 12, in one embodiment, allows for the transverse portion of the transverse and elevating mechanism 10, used on a firearm such as that of Fig. 7 to be discussed, to be set to zero by simply, in one motion, pulling a knob 14 out, turning its dial 14A to zero, that is, so that the zero graduation lines up with the hairline 12A of the control knob assembly 12, and then releasing the knob so that it snaps back to its original position. The zeroing of the present invention is accomplished without disturbing the firearm on which it is mounted.

The control knob assembly 12 further comprises a transversing ball plunger 16, a pin yoke 18, and a set screw 20. The control knob assembly 12 is to be further described with reference to Fig. 5. The control knob assembly 12 provides for the adjustment of the transverse portion of the transverse and elevating mechanism 10, whereas the elevating adjustment is provided by the elevating assembly 22.

25

The elevating adjustment assembly 22 comprises a hand wheel elevating adjustment device 22A (partially shown in section), a plate 24 scaled in elevation graduations of, e.g., 50 yards, upper and lower elevation screws 26A and 26B, respectively, and a base 28. The base 28 is clamped to the lower elevating screw 26B by

5 means of fastening means comprising a threaded bolt 30, a self-locking nut 32A, and a washer 34. The transverse and elevating mechanism 10 may be further described with reference to Fig. 2 which is a view taken along line 2-2 of Fig. 1.

10 The elevating adjustment assembly 22 further comprises a ring 36 for holding against the upper elevating screw 26A, and a set screw 38 cooperating with a spring 40. Both the spring 40 and set screw 38 are interconnected to the elevating hand wheel 22A, to the ring 36, a steel ball bearing 42, an externally threaded ring 44,
15 and a set screw 46 for releasably attaching the elevating hand wheel 22A to the lower elevating screw 26B. As seen in Fig. 2, the lower elevating screw 26B has a stepped arrangement with its upper portion fitting between both the elevating hand wheel 22A and the ring 36. The upper elevating screw 26A is arranged with the lower
20 elevating screw 26B in a telescopic manner. The lower elevating screw 26B houses the upper elevating stop assembly 50.

The base 28 has attached on its outer periphery a stop assembly 52 which, in turn, has about its outer periphery a spring
25 pin 54. The base 28 further has attached thereto a base block assembly 58 comprising a set screw HEX socket 60, a plunger 62 and a cap plunger 64 arranged as shown in Fig. 2. The lower portion of the base 28 may be further described with reference to Fig. 3 which is a view taken along line 3-3 of Fig. 2.

5 During assembly, the stop assembly 52 is attached to the lower
elevating screw 26B so as to prevent disassembly thereof from the
base 28. The stop assembly 52 is attached to the base 28 by
staking the stop assembly 52 at four separate locations 66 shown in
Fig. 3. The elevation setting may be further described with
10 reference to Fig. 4 which is a view taken along line 4-4 of Fig. 2.

 During assembly, with the pointer 68 preferably aligned within
+/-0.3 of the zero graduation mark as shown in Fig. 4, the ring 36,
15 associated with the hand wheel elevating adjustment device 22A, is
preferably staked at four spaced apart locations (not shown) around
the ring 36 so as to retain the pointer 68 at its desired location.
The setting of the control knob 14 related to the traverse
operation of the traverse and elevating mechanism may be further
20 described with reference to Fig. 5 which is a view taken along line
5-5 of Fig. 2.

 The control knob assembly 12 provides for a rapid zeroing of
the traverse portion of the traverse and elevation mechanism 10.
25 This rapid zeroing is provided without altering the actual or
operating position of the transverse and elevating mechanism 10.
The control knob assembly 12 shown in Fig. 5 comprises a yoke 70,
a set screw 72, a washer 74 that is in operative cooperation with
the self-locking nut 32B already mentioned with reference to Fig.
30 1, and traversing screw 78.

5 The control knob assembly 12 further comprises a click ring 80 having a woodruff key 82 that is inserted and maintained within a keyway 78A of the traversing screw 78. The ring 80 is dimensioned to have a first opening (not shown).

10 The control knob assembly 12 still further comprises a bushing 84 having first and second ends with the second end having a lip 84A thereat. The bushing 84 is dimensioned so as to be placed around an extending shaft portion 78B of the transversing screw 78 and so that its lip 84A abuts up against a retaining means provided
15 by the self-locking nut 32C.

 The knob 14 of the control knob assembly 12 has an interior with first, second and third cutouts each having predetermined dimensions respectively defined by step portions 14C, 14D and 14E
20 as shown in Fig. 5. The knob 14 has an exterior with first and second stepped portions, with the first portion carrying a dial 14A shown most clearly in Fig. 1 as having graduations around its border and with one such graduation indicating the zero position of the transverse portion of the transverse and elevating mechanism
25 10.

 As seen in Fig. 5, the first cutout defined by the step region 14C is dimensioned so as to have a diameter that accepts the insertion of a click ring 80. The second cutout defined by the
30 step portion 14D is dimensioned so as to have a diameter that

5 accepts the insertion of the first end of the bushing 84. The third cutout defined by step portion 14E is dimensioned so as to have a diameter that is greater than the diameter of the second cutout defined by step portion 14D and so as to accept the lip 84A of portion 84.

10

A compression spring 86 having first and second ends is dimensioned so as to be insertable into both the second and third cutouts as shown in Fig. 5 and so that the first end of spring 86 abuts against the lip 84A of the bushing 84 and the second end thereof abuts up against the step portion 14C. The control knob assembly 12 further comprises a dowel pin 90 dimensioned to be inserted into and maintained within both the click ring 80 and the knob 14. The control assembly 12 may be further described with reference to the exploded perspective view thereof of Fig. 6.

20

As seen in Fig. 6, the knob is connected to the click ring 80 via dowel pin 90 (note that the dowel pin 90 is fixed to the knob 14 and loosely rides in one of the holes in the click ring 80. The click ring 80 is rigidly fastened to the traversing screw 78 via a woodruff key 82. When the knob 14 is turned, the knob 14 turns click ring 80 and thus the traversing screw 78 which moves the gun to be further described with reference to Figs. 7 and 8. After the gun is in position, the knob 14 can be "zeroed."

5 **OPERATION OF THE**
CONTROL KNOB ASSEMBLY

10 With continued reference to Fig. 6, to zero the control knob
assembly 12 the knob 14 is merely pulled out away from the yoke 70
along the axis of the traversing screw 78. This action releases
the connection between the knob 14 and the click ring 80 by pulling
the dowel pin 90 out of the click ring 80. The knob 14 is then
allowed to spin freely. When the appropriate reference point
15 (i.e., zero) which is printed on the knob 14 lines up with the mark
on the knob 14 lines up with the mark on the yoke 70 (shown in Fig.
1 by reference 12A), the knob 14 can be released. When the knob 14
is released, the spring 86 acts against the busing 84 to force the
knob 14 (and thus the dowel pin 90) back into a hole in the click
20 ring 80. The knob 14 and the traversing screw 78 are again locked
together ready for their next usage.

25 It should now be appreciated that the practice of the present
invention provides for a control knob assembly 12 that easily
allows for the traverse portion of the traverse and elevating
mechanism 12, in one motion, to pull the knob 14 out, rotate the
knob 14 to zero, and let the knob 14 snap back in place without
moving the gun.

30 The transverse and elevating mechanism 10 may be used with
various firearms with one such firearm being a tripod-mounted gun
arrangement 94 of Fig. 7 which includes an automatic gun 96 shown

5 therein. Further details of the elevating and transverse mechanism
10 for the tripod-mounted gun arrangement 94 are illustrated in
 Fig. 8.

 Fig. 8 illustrates the tripod-mounted gun arrangement 94 with
10 the automatic gun 96 removed therefrom so as to illustrate the
 automatic gun holder 98 and a transverse bar 100 having graduations
 thereon. Fig. 8 also partially illustrates hands 102 of an
 operator 104 (not shown) used to adjust the transverse and
 elevation mechanism 10, in particular, the control knob assembly
15 12.

 In operation, the operator 104 lowers the holder 98 over the
 transverse screw 78 (not shown) of the control knob assembly 12 and
 then inserts the yoke pin 18 of the control knob assembly into the
20 holder 98. The zeroing of the control knob assembly 12 is then
 accomplished in a manner as previously described with reference to
 Fig. 6.

 Although the invention has been described with reference to
25 specific embodiments, this description is illustrated and is not to
 be construed as limited in the scope of the invention. Various
 modifications will occur to those skilled in the art without
 departing from the spirit and scope of the invention.

ABSTRACT OF THE DISCLOSURE

A control knob assembly is disclosed that may be generally used for the rapid zeroing adjustment of a dial thereof and is particularly suited for rapid zeroing of a transverse and elevating mechanism for an automatic gun.

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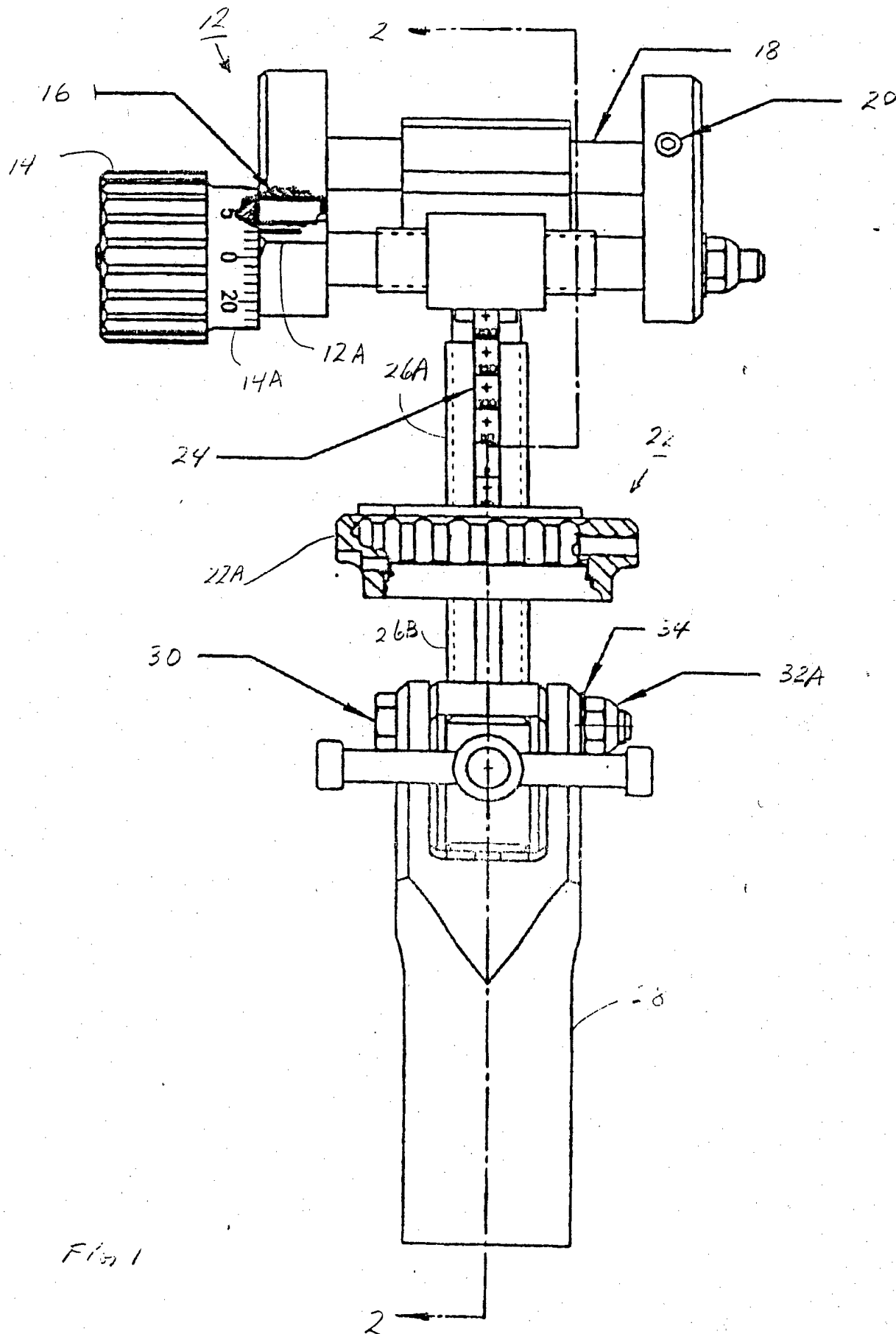


Fig. 1

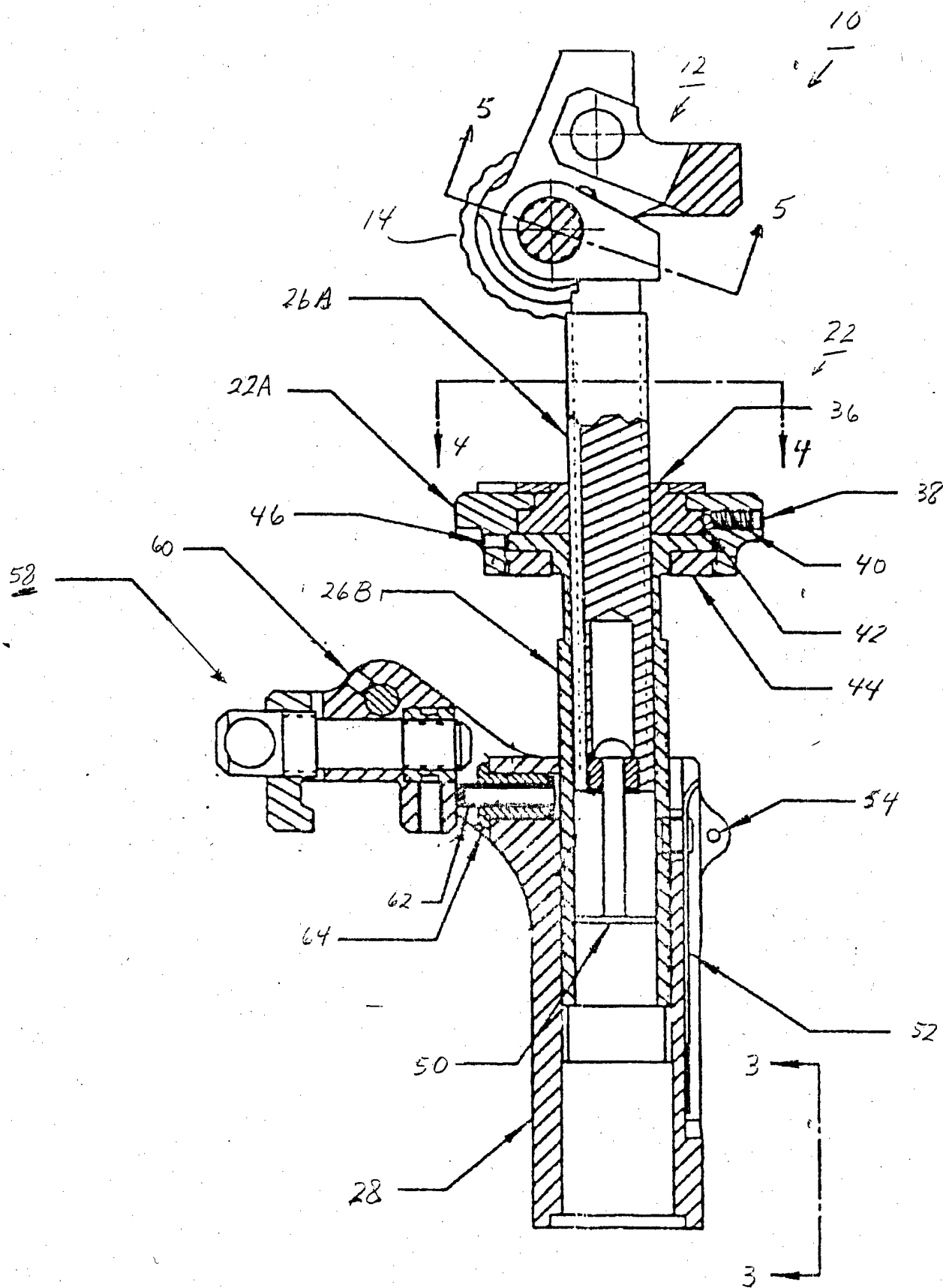


FIG 2

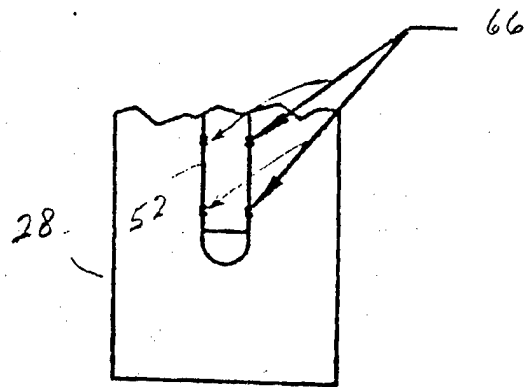


FIG 3

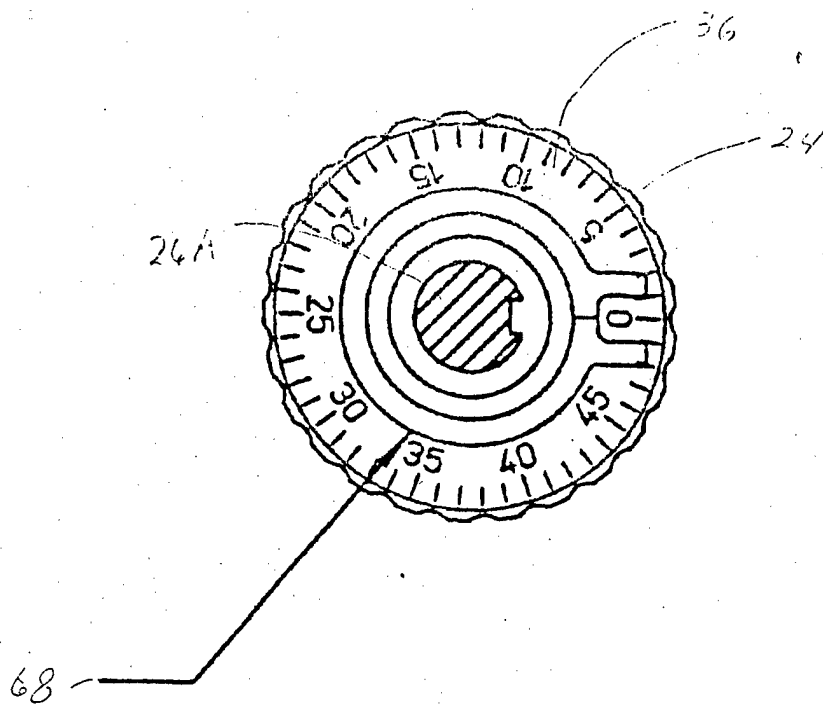


FIG 4

12
4

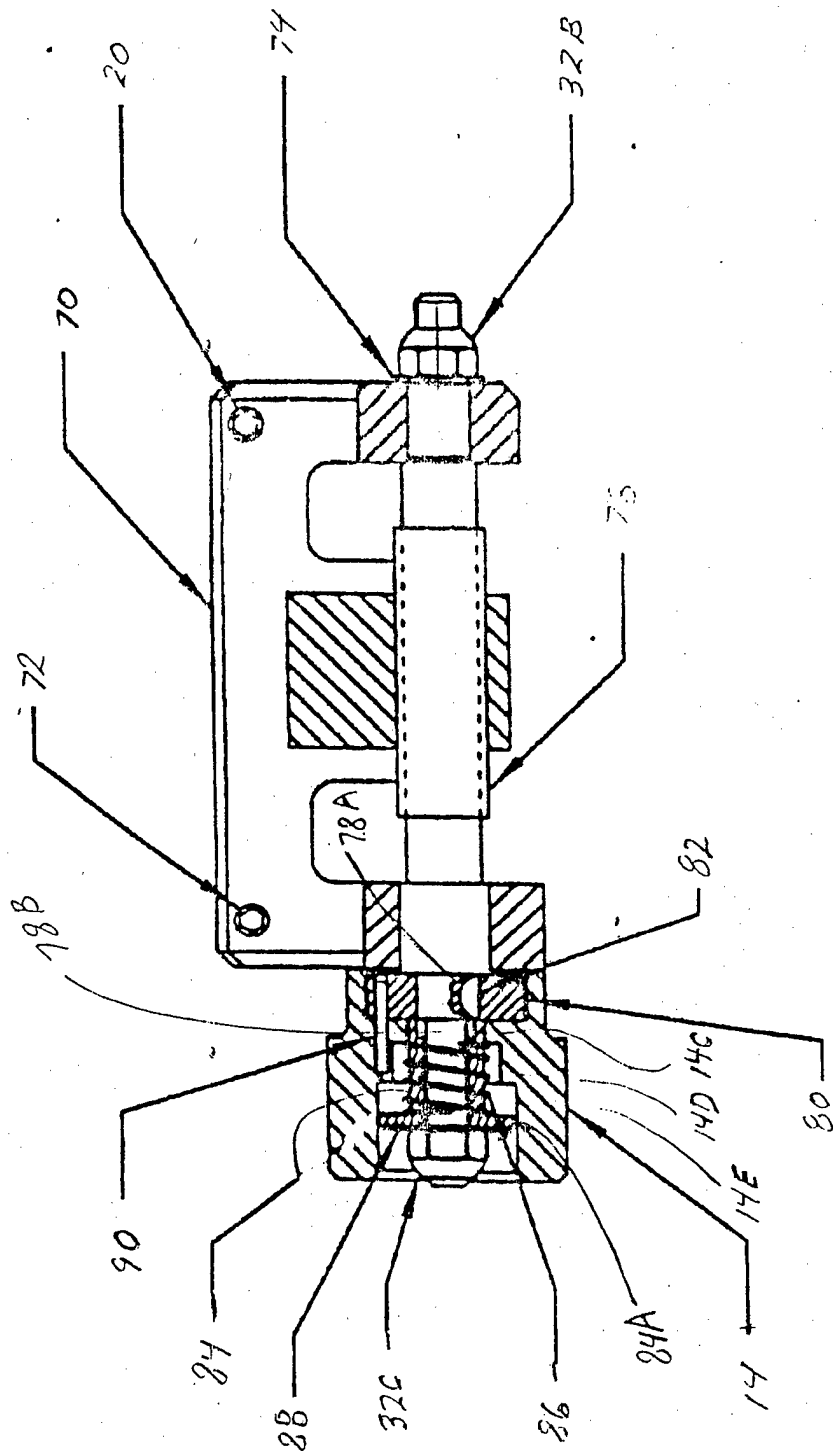


Fig 5

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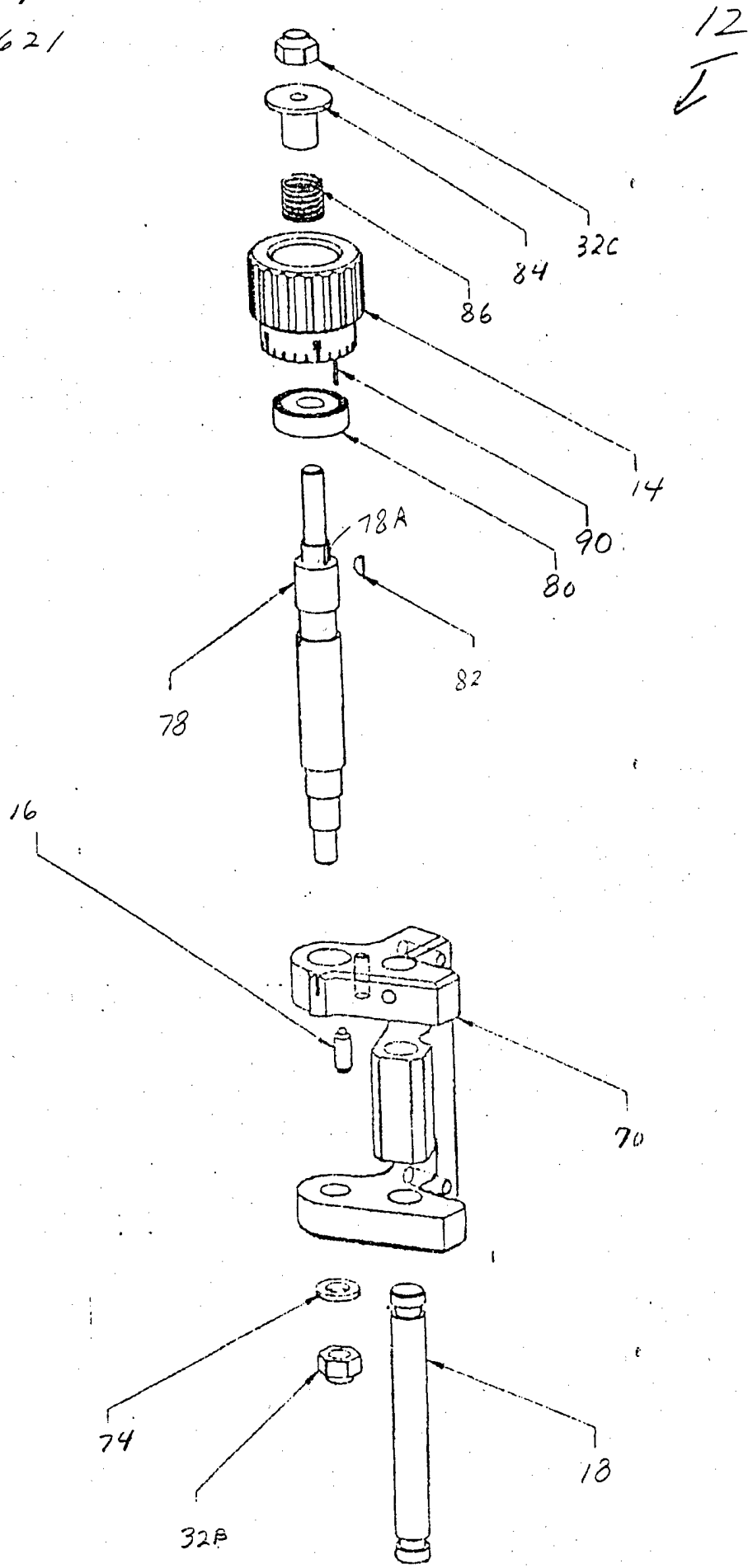


FIG 6

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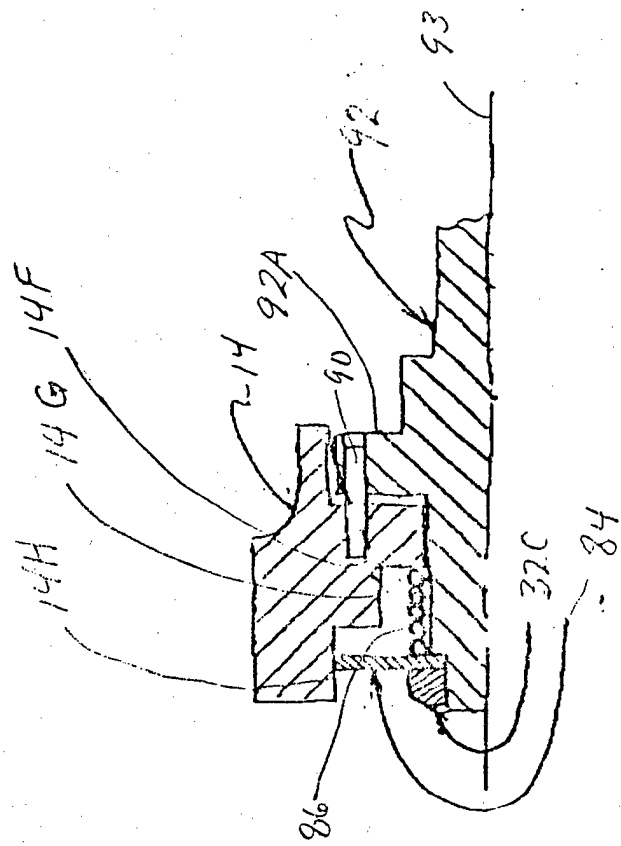


FIG 7-

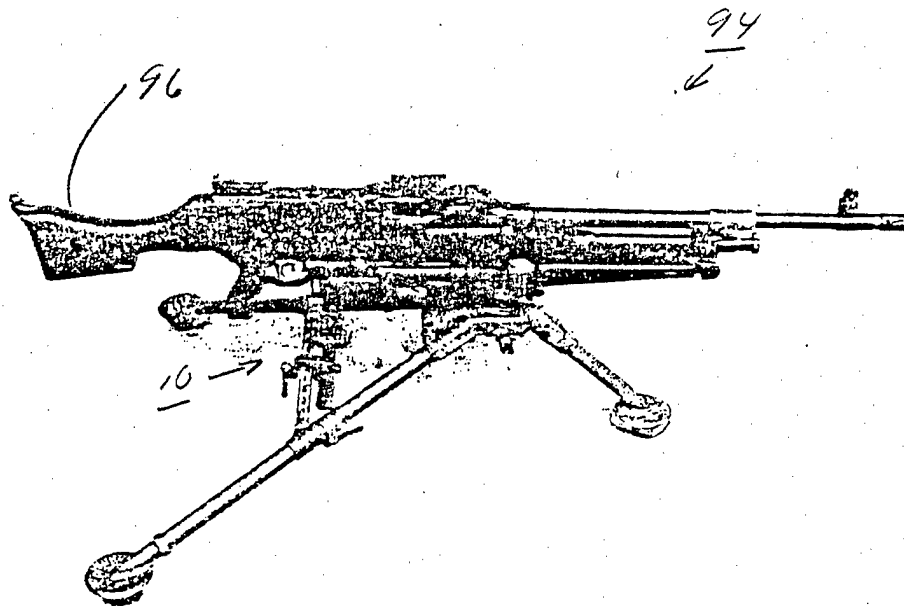


FIG 8

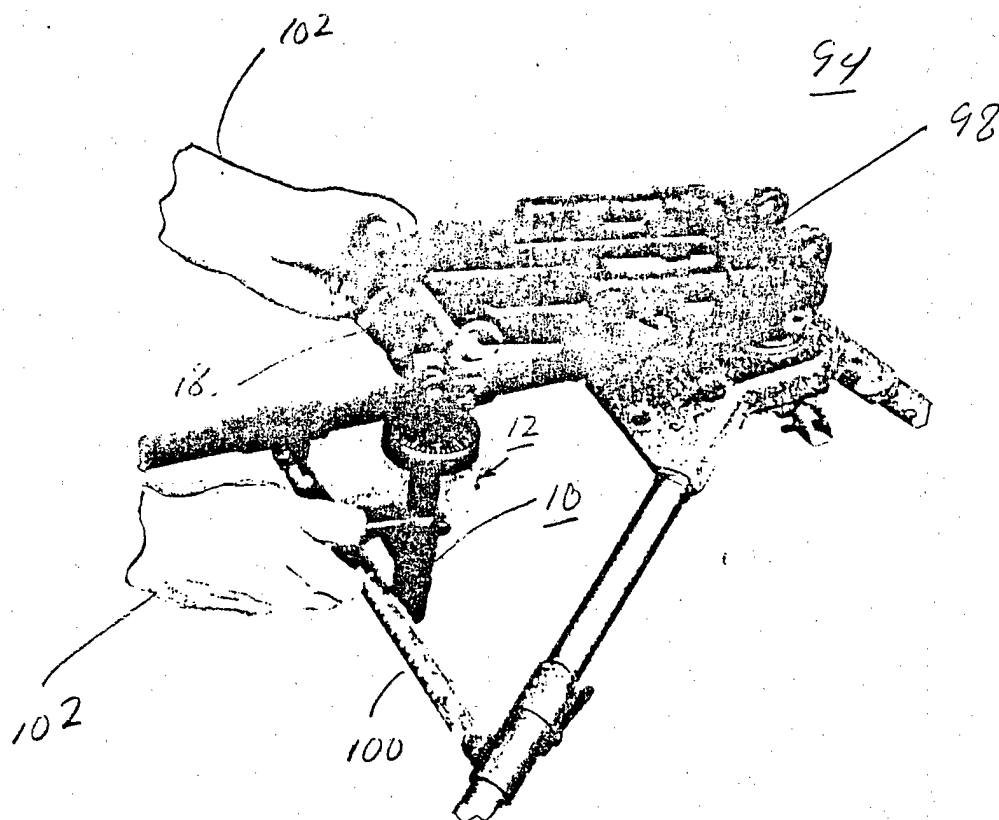


FIG 9